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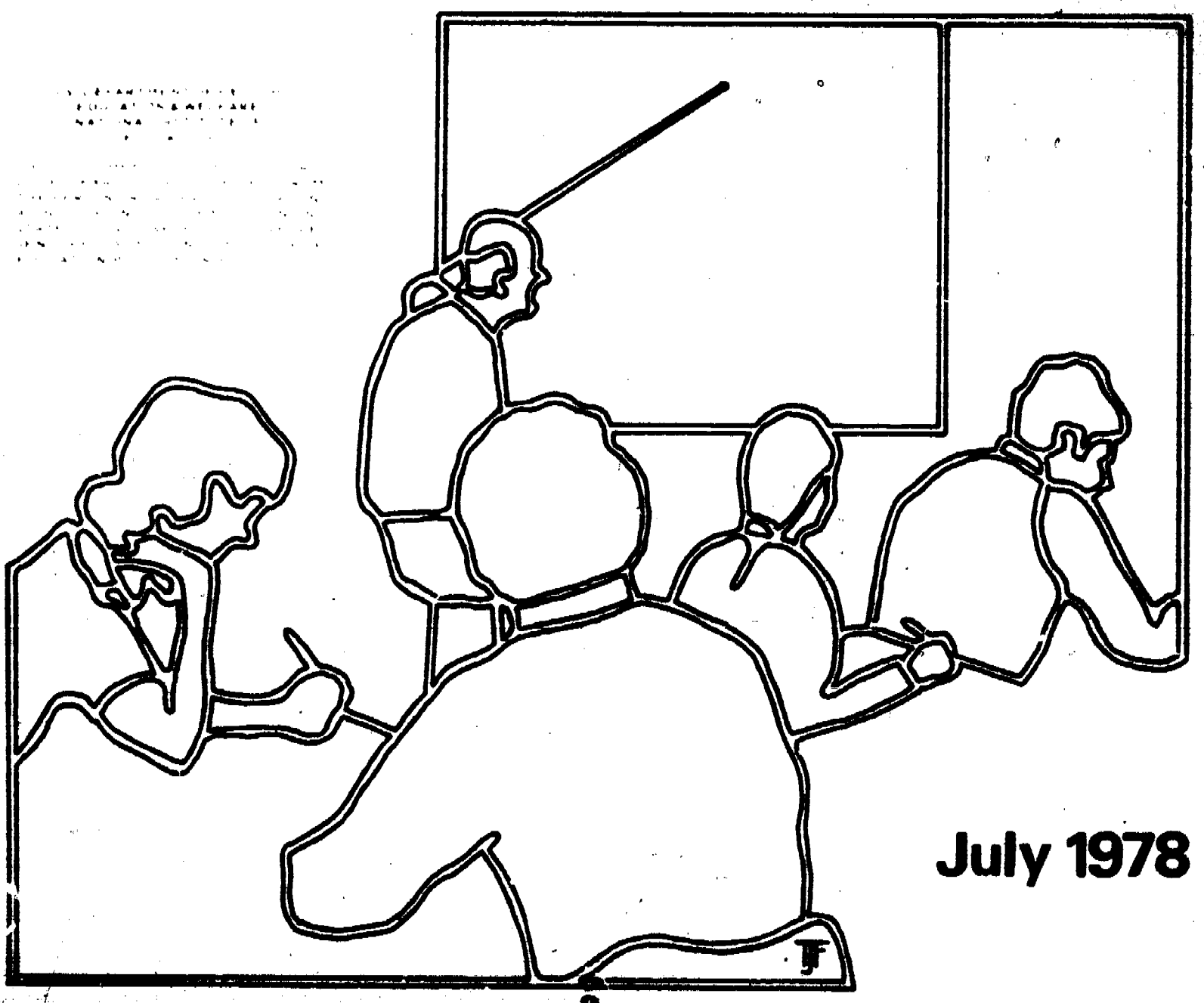
ABSTRACT

A Task Force of 21 people representing faculty, department chairmen, and administrators at Amarillo College (AC) was organized into committees to investigate the use of the computer at AC and future data processing needs in areas of instructional support, administrative support, and equipment and software selection. Compared to computer applications related to instruction, counseling, and related activities which exist across the country, there was relatively little current use of the computer as an instructional tool at AC. Reasons included the lack of current computer compatibility, the newness of practical and cost-effective instructional programs, the time required to prepare them, and limited faculty awareness. The study revealed a fairly heavy reliance upon computer support for three levels of administrative applications: administrative operations, administrative reports, and planning and management systems. In all, 23 basic administrative operations were being conducted with extensive computer support, most of which were grouped in areas of budget and payroll, student enrollments and achievement, and library functions. The equipment and software selection committee investigated the current status of data processing equipment and made recommendations for acquiring an updated system. (AYC)

COMPUTER SUPPORT NEEDS AT AMARILLO COLLEGE

A Report of the Information System Task Force



July 1978

EXECUTIVE SUMMARY

In the summer of 1977, President Lutz specified that a Task Force of college personnel be established to review the use of data processing at Amarillo College. The current computer equipment contract runs for a five-year period from September 1974 through September 1979. This review was to serve as a basis for determining our future data processing needs prior to entering into a new lease or purchase contract. The purpose of the project was to review both administrative and instructional uses of the computer and to develop recommendations for new applications, equipment and software.

A Task Force of 21 people representing faculty, department chairmen, and administrators was organized into committees to study areas of instructional support, administrative support, and equipment and software selection. The Task Force met periodically from September 1977 through June 1978. Meetings of committees were scheduled as necessary. The project schedule called for a Task Force report during June 1978, issuing a request for proposals for equipment and software during August, installing the new equipment during May 1979, and becoming operational by August.

This report contains sections on instructional applications, administrative applications, and equipment and software selection. The report narrative summarizes the findings of the committees and an Appendix contains details for those who wish closer scrutiny.

The Instructional Support section summarizes the "state of the art" applications related to instruction, counseling, and related activities which exist across the country. It notes that there is relatively little current use of the computer as an instructional tool at Amarillo College, both in comparison with the extent of administrative applications and in terms of the potential use of the computer as an instructional tool. REasons for the lack of instructional applications include the lack of current computer capability, the relative newness of practical and cost-effective instructional programs, the significant time required to prepare them, and limited faculty awareness of recently-developed programs which are successfully used at other colleges. The report recommends that computerized support for instruction should be developed and used at Amarillo College in instances where it is cost-effective.

There is a fairly heave reliance upon computer support for administrative applications, and much of this has occurred during recent years. This reliance can be attributed to

several factors: significant technological improvements in computers, reduced costs, broadening knowledge about administrative computer applications, a search for cost avoidance by eliminating clerical procedures and reducing personnel expenditures, and a growing emphasis upon administrative accountability which requires a greater frequency and increased timeliness of reports. Three levels of administrative applications were noted: (1) administrative operations, where the computer provides for an increase in speed, accuracy and reliability of transactions as compared to those completed by clerical personnel; (2) administrative reports which provide information for broader institutions use; and (3) planning and management system which collect data from operating departments uder controlled conditions of time, accuracy, definition, and procedure, and make them available for central storage, retrieval, and analysis. Planning and management systems require greater preparation and expense, but more readily service the needs by individual departments for operations control and by top management offices for planning, resource allocation and other management functions.

In all, 23 basic administrative operations are now being conducted through extensive computer support at AC. Most of these are grouped in areas of budget and payroll, student enrollments and achievement, and Learning Resource Center (Library) functions. There are currently 178 administrative and management reports being prepared by computer support, and an additional 49 are anticipated for development during the near future. Additional information about these reports and their use is contained in the Appendix. These administrative operations and reports are supported by 36 computerized data files, the scope and quality of which reflects varying emphasis or underdevelopment during recent years.

The section on equipment and software selection reports on the current status of data processing equipment and provides recommendations for acquiring an updated system. This section outlines our equipment and software needs and suggests that we follow a Request for Proposal approach to obtaining the optimum computer system at the lowest cost. The Requrest for Proposal document is to be developed separately from this report.

The current computer equipment at AC includes a UNIVAC 9480 multiprogramming 131K computer, which allows local batch and some remote teleprocessing applications. Seven terminals allow on-line use in Business, Registrar, Learning Resource Center and Computer Center departments. The Computer Information Systems (CIS) Department uses the computer on a batch entry basis. The Computer Center has a

staff of five full-time employees. The computer system lacks several characteristics which are necessary for needed support of instructional and administrative applications. These include adequate core and memory, interactive software, necessary programming languages, adequate data base management, and sufficient teleprocessing capability.

The cost of computer rental and maintenance is funded in part by state reimbursement for CIS instruction, and cannot be precisely allocated between instructional and administrative functions. However, for 1977-78, $173,200 of a total expense of $285,230 for computer operations and CIS instruction is funded from external (largely state) sources.

Summary of Recommendations

Ther report contains recommendations related to equipment and software needs, staff development for both instructional and administrative personnel, technical assistance for developing new applications, a system for developing priorities and work scheduling, and financial support. The development of specific new applications is beyond the scope of this report.

The committees for both instructional and administrative applications called for a liaison person to assist in specifying and preparing new applications. Such a person would need knowledge of general administrative procedures or instructional activity, specifications needed by the programmer-analyst, some knowledge of existing similar applications, and an ability to communicate with a variety of non-computer persons and computer center personnel.

The need for staff development related to use of the computer in various fields of instruction and administration, including knowledge of applications generally available in given fields and how to develop new applications, was firmly noted. A program of college staff development during 1978-79 and beyond was recommended to enable more individuals to learn how to use the computer as an efficient and effective tool.

It is recommended that instructional departments whould budget for the cost of teleprocessing equipment, service contracts, and other approved expenses for new programs. In addition, it may be helpful to provide released time for faculty members to develop new programs or adapt existing ones for their instructional areas. The projected value and cost of such programs should be a major factor in evaluating their worthiness for advanced budgeting.

Even with significantly upgraded equipment which should allow support for new applications, it will still be necessary to establish priorities for their development. Such priorities and anticipated completion schedules should be prepared in terms of the goals of the College and the overall availability of financial resources.

Recommendations for computer equipment and software include: a central processing unit of one megabyte (1,000,000 bytes) of memory, a minimum of 300 megabytes of disk storage, several tape drives, a medium-speed and a low-speed printer, and from 24 to 30 remote terminals. Operating system software must be available to support multiple concurrent batch processing and on-line time sharing processing. This array of equipment and software will be significantly more capable and efficient in simultaneously serving multiple users than is our current one. Other recommendations are related to performance times, job accountability, physical security and location of the Center, ease of user access and file management. It is recommended that the Computer Center by relocated from its present location in the Business Building to the second floor of the Administration Building to provide for improved security.

The recommended approach for obtaining equipment and software is through a formal Request for Proposal (RFP) procedure. The RFP is a document in which the user requesnts the potential vendor to submit a proposal for a system to satisfy specified needs. The RFP puts the vendors into a directly competitive position to assure their responsiveness to the user's needs at the least cost.

COMPUTER SUPPORT NEEDS AT AMARILLO COLLEGE

A Report of the Information System Task Force

Amarillo College
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July 1978

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Introduction

On July 28, 1977, President Lutz specified that a Task Force of college personnel be established "to develop a comprehensive information system for the college, to include adequate data files and a system of timely reports to management and operating positions." At the time it was thought that our computer system was not being utilized as fully as the need might justify. Upon additional investigation, observations were made about a lack of knowledge by college staff on uses of the computer, and its values and limitations; a lack of information to management personnel about how the computer is being used; and a near absence of instructional applications except in the Computer Information Systems program. It was further observed that the computer was being used extensively in administrative operations, but its use as a tool for a system of management information and college planning has not been developed, although the need is considerable.

Objectives for the Project

This project was a college-wide effort to review administrative and instructional uses of the computer, both current and desired, and to develop recommendations for new applications. It was implemented to plan properly for entering into a new computer lease or purchase contract when the current one expires in September 1979. Specific objectives were developed during early meetings of the Task Force, and include the following:

1. Develop a detailed survey of existing computerized applications and data files.
2. Recommend new applications in instructional support, administrative operations, and management reports.
3. Identify extension and maintenance of the computerized data base.
4. Identify general and specific software development.
5. Specify new equipment, including teleprocessing and terminal facilities.
6. Identify staff development needs for faculty and administrative personnel.
7. Recommend data processing personnel and staff organization for operating the Computer Center.

Organization of the Task Force

The Task Force of 21 people represented faculty, department chairmen, deans and other administrators. A complete list of members, their college positions and committee assignments within the Task Force is shown in Appendix A. The Task Force met for the first time on September 19, 1977 and continued meeting on nearly a monthly schedule through

June 1978. At first the Task Force met as a whole, to determine an understanding of its work and how to complete it. During October, four committees were organized to consider areas of instructional support, administrative operations, management reports, and equipment and software selection. At the same meeting, a schedule was adopted which called for completing computer specifications by June 1978, requesting proposals from vendors by August, and having the new equipment operational by August 1, 1979. More complete information about the project schedule is shown below.

Phase	Date
Complete equipment & software specifications	June 1978
Issue request for proposals	August 1978
Select proposal	Nov. 1, 1978
Install equipment	May 15, 1979
Begin operation of new equipment	August 1, 1979
UNIVAC contract expires	Sept. 30, 1979

Early during the project it became apparent that members of the Task Force and other college staff would benefit from an orientation on computer operations and applications. Three two-hour seminars were scheduled during late January and early February. Between 75 and 95 persons attended each seminar. Written evaluations rated their value from fair to excellent.

During this time the work of the Task Force had stopped, but by late February it began again. It soon became apparent that the two committees on Administrative Operations and Management Reports could be combined, and from that point these two groups met as a joint Administrative Support Committee. The Equipment and Software Selection Committee met during February and March to conduct an initial survey of its work and to draw tentative conclusions about the type of equipment and software requirements that might later be justified by reports of the other committees. This Committee then suspended meeting until following the submittal of reports by the other two committees. The Instructional Support Committee and the joint Administrative Support Committee submitted comprehensive reports to the Task Force in May.

Organization of this Report

An executive summary of this report is shown immediately inside the cover sheet to allow the reader a quick overview of the project, its findings and recommendations. The report narrative contains three sections on instructional applications, administrative applications, and equipment and software selection. Within each section are recommendations which have been developed by committees of the Task Force to improve computer capability and use.

An Appendix to the report is bound in a separate volume. This Appendix contains detailed information developed during committee surveys of current and requested applications. Included is considerable information relating to administrative reports, their distribution and the supporting data base needed to provide for both current and future administrative and management reports. The material related to instructional applications is more general, reflecting the lack of current applications and lack of an immediate readiness to recommend specific new applications.

Instructional Support

The Instructional Support Committee was charged with evaluating current use and projecting future use of the computer as a direct support for instruction at Amarillo College. To accomplish this task, various instructional applications were categorized as follows:

1. Computer Assisted Instruction
2. Computer Managed Instruction
3. Testing
4. Computer Education
5. Problem Solving
6. Simulation
7. Counseling

This section of the report discusses these applications. It first deals with the "state of the art" of instructional computation, then includes results of a survey of current and possible future applications at Amarillo College, and closes with recommendations.

State of the Art

The doors of community colleges are open wider than ever before to accommodate a new influx of students--under-achievers, minority groups, and older adults--which makes heterogeneity a rule rather than an exception. A concurrent trend is the expansion of college services into the community to reach segments of the population heretofore untouched. Because the talents and deficiencies of these students differ so dramatically, the faculty is finding the task of teaching increasingly difficult. Thus, individualization is no longer an intellectual proposition, but a dire necessity.

Several techniques of utilizing the computer to individualize instruction have evolved. The most ambitious of these are Computer Assisted Instruction and Computer Managed Instruction. Computer assisted instruction is the concept of direct student-computer interaction, which requires the largest amount of computer-related equipment and computer time. Computer managed instruction allows the computer to keep records, collate, and diagnose results performed away from the computer and prescribe additional study assignments, which requires less computer-related equipment and computer time.

Computer testing and evaluation is another technique which aids the classroom teacher by helping him to develop tests. Before the system is used for a particular subject

or class, a set of questions is developed and stored in the computer. This is a one-time process. The instructor can request the computer to generate a test by submitting the description of it--that is, the number of questions, the number of questions by degree of difficulty, the category, and the other optional attributes. Student answer sheets can be scored automatically by the system. A printout is generated which reports the following:

(a) the number of questions a student answered right, wrong, and those omitted, with the resulting score;
(b) a summary for all students, showing by raw scores and percentages features of test results such as mean, median, range, variance, standard deviation, standard error of mean, and others; and
(c) an item analysis showing by question number the number of students with the right answer, the wrong answer, or omitted answer, and the number of students selecting each alternative answer. This process leads to test improvement.

Computer education and problem solving are two additional instructional techniques. Computer education acquaints the student with the applications of the computer, as well as its programming and operation. Problem solving assumes the user has received prior preparation on the use of computers, and he is now using it purely as a tool to further his educational process.

Another instructional application is Computer simulation. An example would be management gaming. Various controllable aspects of a business enterpr..., such as advertising budget, research budget, production volume, and product price may be determined within limits by the student. These decisions are fed into the computer, which then simulates the operation of the business and prints out reports indicating, for example, sales volume, current inventory, statement of profit and loss, and production capacity for another period. Through simulation, the student obtains a better concept of the cause and effect of each decision.

One of the newest applications of the computer is in counseling. This application is an on-line system designed to help the student research and select vocations commensurate with his abilities and interests. The computer data file contains detailed information on various occupations, job opportunities, and job requirements. It contains similar data about colleges, universities, and specialized technical schools. Through a process of eliminating various options, the student plans his occupational and educational program. The counseling office may also retrieve information directly from the student master file and relate the student's past achievement to the vocational or additional education he is planning.

Overall, computers have the potential to free teachers for the interpersonal contact that will assist an individual student to critically analyze and synthesize day to day information for problem solving and communication.

Survey of Amarillo College Applications

There is relatively little current use of the computer as an instructional tool at Amarillo College, especially in comparison with the extent and breadth of administrative and management use of the computer and in terms of its potential. There are a number of reasons for this nonuse, including limitations of the existing computer system to support instructional applications, lack of faculty awareness of newly emerging applications, significant time requirement for developing or adapting new software and "course ware," and the uncertainty that developmental efforts will be sufficiently effective to justify their cost. Nonetheless, instructional applications now exist in areas of computer education, problem solving, and statistical analyses for evaluation. Courses in computer operations and programming were taught to 155 students during the spring of 1978 who were majoring in computer information sciences. In addition, applications in problem solving were taught in certain classes in applied sciences. Two departments are planning this summer to conduct statistical analyses to support ongoing evaluation projects.

Appendix B shows the results of a survey of current and requested computer applications. The list of current applications probably overstates existing computer support activity. The list of future applications may contain many items which will not, upon further investigation, promise to be cost effective. Still the Task Force believes that there are opportunities for additional computer applications which will enhance the educational processes at costs consistent with gains in effectiveness. Thirteen departments have shown a strong interest in future use of the computer for instructional support. Their interest suggests the following descending order of demand:

Testing in course work
Statistical analysis for evaluation
Problem solving
Computer-managed instruction
Computer education
Computer-assisted instruction
Simulation
Counseling
Testing for counseling purposes

Recommendations

In order to provide adequately for computer support of instruction which is likely to be requested during the near future, due consideration must be given to basic equipment needs, software requirements, staff development, and the procedure for developing and implementing new applications. Equipment needs are discussed fully in a subsequent section of this report. Other considerations are noted in the paragraphs which follow, including several recommendations.

The cost of developing software for instructional applications can be minimized through acquiring programs developed by other educational institutions. There are hundreds of such packages available, many of which would require no alterations; others might need modification to fit local equipment or educational requirements. In the latter case, the program logic must be available in a proven form to assist in program rewriting.

The recommendations which follow reflect a growing interest of faculty and numerous proposed applications by instructional departments.

1. Technical staff. The computer center must be appropriately staffed to handle an increasing work load. Specialized expertise in programming for instructional applications will have to be readily available.

2. Liaison staff. Initially one person, perhaps part time, should serve as liaison between individual faculty members and the technical staff in the computer center, assisting faculty in the preparation of instructional applications. Such a person must be knowledgeable in computer technology and should also have a sound background in classroom instruction. In order to function freely, this person should be autonomous from both the computer center staff and the department of Computer Information Systems.

3. Financial support through departmental budgets. Financial support, in addition to provision for central computer equipment and staff, will have to be afforded through individual departmental budgets for remote equipment (such as mini- or microcomputers), service contracts, supplies and other direct costs of implementation. In addition, it may be useful to provide released time for faculty members to develop new programs and adapt ready-made instructional packages to their teaching areas. Ample time must be allowed for program development and implementation, sometimes a period of two or more years. An evaluation component should be included in plans for developing new programs in order to determine true cost effectiveness.

4. Staff development. A program of staff development should be undertaken in the use of the computer as an instructional tool for interested faculty and related personnel. Staff development experiences may include on campus workshops and formal courses offered by colleges and universities. Such courses might be offered for credit on the AC campus.

5. Setting priorities. Initial recommendation of specific projects should be made by department chairmen and the respective deans. Final determination of priorities and scheduling for bringing new applications on line must be geared to the goals and overall financial resources of the college.

Administrative Support

This section reports on the survey of administrative and management applications at Amarillo College and contains recommendations for more effective and extensive use of such applications. It traces briefly the emergence of computers as a management tool in higher education and portrays several levels of computer use. ranging from routine clerical operations to complex information and planning systems. The results of the survey of existing and proposed administrative applications are merely summarized in the narrative of this report, but they are contained in detail in the Appendix. The Appendix will be of greatest value to those who are directly responsible for the design, implementation and maintenance of a growing system of administrative support.

Types of Administrative Support

At Amarillo College, as at other colleges across the country, the first computer applications were instruction in data processing, and administrative support, usually in selected areas of student registration and academic records. Through the past decade several changes have resulted in increased demands on computer systems. Briefly, these changes include:

1. Significant technological improvements in computers, in increased memory and data storage capacity, better software systems which resulted in simplified programming requirements, and others.
2. Reduced per usage costs.
3. Increased knowledge about computer applications by technical, administrative, and faculty personnel.
4. Greater availability of software for specific applications in the field of higher education.
5. Drastic increase in the amount of operational information demanded by state and federal agencies.
6. A search for cost avoidance through "computerization" as a result of spiraling personnel costs for conducting administrative procedures.
7. Growing emphasis upon "accountability" of both outcomes and costs in higher education, including a greater frequency and increased timeliness of reports.

The current administrative applications at Amarillo College may be viewed in three levels: administrative operations, administrative reports, and planning and management systems. Administrative operations are oriented toward

increasing the speed, accuracy, and general effectiveness of daily clerical operations, but they provide only minimal support for management information needed by administrators for institutional control, policy review, and planning. This is so because each operation is centered in one department and is designed to effect transactions and provide information of unique use to that department. Each operation may involve a separate file of information, based on procedures and definitions that are generally not understood across the college.

Administrative reports from such departmental operations sometimes provide information for broader institutional use, but the conditions just described place severe limits on the use of such reports. Problems of data timeliness and definition are profound. Also, the use of separate departmental data files can cause problems of accessibility and programming which are costly to overcome, and which may be virtually unsolvable.

A management information system, sometimes called a planning and management system, is an attempt to collect data from operating departments under controlled conditions of time, accuracy, definition and procedure, and make them available for centralized storage, retrieval, and analysis. This information system emphasizes the capability to integrate and display data from various files, both current and historical, for numerous management purposes. Essential elements include (1) an integrated data base, (2) commonly defined data elements, (3) a generalized approach to information retrieval, and (4) techniques to assure the security and integrity of the data in the files (data base). The information system is intended to serve both the needs by individual departments for operational information and by top management for planning, resource allocation and other management functions.

In general, the amount of data or information which a college is expected to have readily available and to analyze has increased many-fold since the 1960's. In response, a new emphasis on "integrated data base" has emerged in order to allow greater computer support in administration. Integrated data base is defined as a collection of related data files that are connected by a common key so that no data element has to be recorded more than once. It is the goal of the institution to have accurate data available about all aspects of the institution's activities -- the teaching-learning activities, the availability and use of resources, other support functions, the community which the college serves, etc. Thus, through the integrated data base, several files can be brought together to assess or evaluate specific aspects of the college. Since the demands for internal and

external reporting of data are much greater than a decade ago, the data base must be much larger than would have been maintained in years past, resulting in a higher cost.

t Amarillo College we have used data processing mostly for cost avoidance in administrative operations, and also to produce a considerable number of operational and administrative reports. It is necessary now to provide for greater emphasis on college-wide management reports which are based on the supporting elements of the management information system as just described. In a subsequent section of this report, the hardware and software requirements of such a system will be described, but this section focuses on the types of additional reports needed, along with related requirements of data base, staff development, definitions, procedures, and so forth. The expense of providing these requirements is considerable, although the benefits are profound. To a large extent the same system which supports administrative and management needs also supports a growing array of instructional applications.

Existing and Proposed Applications

The two broad purposes of the Information System project were to assess existing and needed computer-supported applications in administration and instruction, and to ascertain the computer equipment and related support needed for these applications for the period beginning September 1979, the date of expiration for the current computer contract. This section of the report discusses our assessment of computer-supported applications in administration only, including (1) computerized administrative operations, (2) administrative and management reports, both those which now exist and which are recommended for future development, and (3) existing data files.

Computerized administrative operations. Twenty-three specific administrative operations are now being conducted at AC through extensive computer support. Most of these are grouped in areas of budget and payroll (6), student enrollments and achievement (4), and LRC (library) and classroom resources (3). A brief description of each of these operations is provided in Appendix C. This information provides a basis of understanding for the computerization of still other administrative functions, with a resulting increase in timeliness and accuracy, and a decrease in personnel cost.

Administrative and management reports. The administrative and management concerns related to operating a college are listed in Table 1, along with the number of reports related to each concern which are now in use and currently being developed at AC. The management of a comprehensive

TABLE 1

ADMINISTRATIVE/MANAGEMENT REPORTS

Type	Total	Currently In Use	Anticipated
Community Characteristics and Needs	0	0	0
Students and Enrollments	65	45	20
Faculty and Other Personnel	7	5	2
Budget, Income and Expenditures	55	50	5
Payroll	38	38	0
Facilities	6	3	3
Educational Programs	14	4	10
Student Services	9	8	1
Student Achievement	12	11	1
Post College Activities	10	1	9
Operational and Support Services	14	13	1
Totals	230	178	52

community college includes attention to community characteristics; students and their achievements; resources of personnel, money, and facilities; educational programs and services; post college activities of former students; and support services and operations. It is noteworthy that existing reports are heavily concentrated in just 3 of 11 college areas and are non-existent in several, reflecting an incompleteness in the current availability of reports and information. In all, 178 reports are currently available. Heaviest concentration is in areas of budget and expenditures (50), students and enrollments (45), and payroll (38). No computerized reports exist in areas of community characteristics and needs; and few in educational programs, post-college activities, faculty and other personnel, student services, and facilities. In addition, 52 reports are now being developed or are planned for early development.

Appendix D contains a complete list of existing and anticipated reports, along with information about their frequency and distribution. A glossary of terms is included to provide a brief word description of each report. Appendix E contains a list of the 52 reports planned for early development to supplement existing reports. It is expected that still others will be needed, especially in underdeveloped areas, to provide a more comprehensive basis for planning and evaluation.

A detailed survey of existing data files and the data elements which they contain was conducted, in order to assess the scope and quality of the current data base. In all, 36 data files were discovered, and listed within the 11 areas shown in Table 1. The scope and quality of data base varies from area to area, reflecting the concentration or absence of reports. Appendices F and G, respectively, contain the findings of this survey.

Recommendations

Several recommendations are offered for upgrading the extent and quality of administrative support and information. These relate to user assistance, schedule and priorities, coordination and staff development.

1. Technical assistance must be provided to persons who wish to develop new or revised applications, to bridge the gap between the limited data processing experience of the user and the role of the programmer-analyst. Accordingly, we recommend providing a user assistance coordinator who will:

   Assist users in developing new applications, to include defining their needs and developing specific instructions to the programmer.

Review current administrative applications, to weed out unneeded ones, consolidate applications where feasible, and update distribution lists of reports.

Assist in developing a detailed procedure for obtaining and providing data to the Computer Center. This effort is a part of maintaining the larger data processing documentation.

2. There is a sizable number of new administrative applications which have been identified in this report, and others will be noted in future months. In order to provide for an orderly work environment in the computer center and communicate to users when new applications will become available, we recommend developing and maintaining a detailed schedule for designing, building, and implementing new applications. Such a schedule is most needed during periods of rapid development, and may be permanently required as the number and complexity of applications grow.

3. There is a clear need for staff development experiences related to use of the computer in various fields of instruction and administration, including knowledge of applications generally available in given fields and how to develop new applications. We recommend that the staff development committee address this need and formulate appropriate experience for the AC staff during 1978-79 and beyond.

4. While there are obvious needs for upgrading present computer equipment, these will be addressed fully in another section of this report.

Equipment and Software Selection

This section reports on the current status of data processing at AC and provides recommendations for acquiring an updated system. It includes a brief survey of existing computer services, outlines our equipment and software needs, and suggests a Request for Proposal approach to obtaining the optimum system configuration at the lowest cost. The Request for Proposal (RFP) is a detailed document which invites potential vendors to develop specific system and price proposals for our consideration. The RFP will be developed as a separate document from this report.

Status of Data Processing

The data processing services at Amarillo College are completed on a UNIVAC 9480 multiprogramming 131K computer. Local batch and remote teleprocessing applications run daily from 8:00 a.m. to 10:00 p.m., Monday through Friday. On-line terminal data entry, update and inquiry are used in the Business, Registrar, Learning Resource Center (Library), and Computer Center departments. These offices use a common integrated data base for processing their various information needs. The Computer Information Systems (CIS) Department uses the computer for instructional purposes on a daily basis. The Computer Center has a staff of five full-time employees and one part-time employee. A complete list of the data processing equipment and software currently used is contained in Appendix H.

In the Administrative Support section, an elaborate analysis of operations and reports was presented with emphasis on detailed content and use. Specific findings were shown in Appendices C, D, and E. The organizational units with major computerized operating functions include the offices of Registrar, Business, Personnel, Learning Resource Center, Security, Financial Aids, and CIS Educational Department. A brief description of the functions for each office follows:

Registrar. Functions include admissions, on-line registration, state reports, final grades and permanent records.

Business Office. Includes disbursements, receivables, equipment inventory, budget and general ledger (in progress).

Personnel Office. Includes on-line payroll and personnel reports.

Learning Resource Center. Includes circulation and holdings inventory.

Security. Includes parking permits and citations.

Financial Aids. Includes state reports, financial accounting (in progress), and student needs (in progress).

CIS Department. Includes processing student programs for the various computer languages, which are RPG, COBOL, Assembler and Fortran; and key to disc entry using the terminal.

Income and expenses. Although computing services are expensive, the state reimbursement for student instruction in Computer Information Systems (CIS), tuition and fees, and other external income pays over half of the combined cost of instruction and administrative computer support. Because the computer is an integral part of the instructional process and because it is funded in part from state monies, the cost of computer rental and maintenance cannot be precisely allocated between instructional and administrative functions. Table 2 contains a list of the income sources and expenses for the combined functions. It shows that $173,200 of a total expense of $285,230 was funded from external, rather than local, sources. It should be noted that external funds vary directly with the number of contact hours of CIS instruction, and that a sizeable increase in CIS instructional load is expected over the coming years.

Limitations. Many of the standard administrative college reporting services depend upon the computer to prepare information for local, state and federal reports. These reports are produced on a timely basis and provide information for certain operating and management decisions. Such services satisfy most of the current administrative operating needs. However, there have been limited requests for more elaborate management information reports, and limited success in producing them. Also, simulation for either instructional or management objectives has not been attempted because of equipment and software inadequacies. Instructional use of the computer has been limited to a "batch" environment for processing student programs. In the area of research, few requests and even less service has occurred. Additional applications, both on-line and "batch," cannot be serviced without additional equipment and software. Current equipment will not support the latest technology for program development through "interactive" terminals. Progress in instructional support has not occurred because of the inability of existing equipment to accommodate the latest "state of the art" software. Also, "cheap access" to the computer is not currently available, due to absence of appropriate systems software and required supporting equipment.

TABLE 2

INCOME AND EXPENSES FOR COMPUTER OPERATIONS

AND CIS INSTRUCTION, 1977-78

Income

State funding for instruction		$148,000
Tuition and fees		17,000
School Empl. Credit Union		8,200
Subtotal (External)	$173,200	
Charges to AC user departments		64,200
Other local income		47,830
Subtotal (Internal)	112,030	
Total income		$285,230

Expenses

Equipment rental		$103,416
Peripheral equipment for instruction		10,999
Computer Center staff salaries and operating expense		86,400
Subtotal	200,815	
CIS Department personnel & operating expense		84,415
Total expenses		$285,230

In summary, growing administrative needs over recent years have created an increased demand for both on-line and "batch" applications, and larger data files. Advances in computer technology render some of the current equipment obsolete for teaching computer classes in the CIS Department. The "interactive" capability is needed for both instructional and administrative processing.

There are essentially two alternative approaches to acquiring adequate computer facilities: (1) lease or purchase a system to be located on the college campus, or (2) lease time on a computer system operated by another organization, using on-campus terminals. Occasionally, a combined approach can be used, with certain functions being performed locally and others being performed on a remote system. Because of the diversity of existing applications at AC and their expected growth in numbers and diversity, it is recommended that we continue to operate and manage our own local system. Difficulties abound in the operation of a comprehensive college service on a remote service center, whereas more limited functions can often be performed at a service center at greatly reduced cost.

Summary of Equipment and Software Needs

The data processing needs at Amarillo College can best be described in the following statements:

Equipment. (Central Site) A central processing unit with a minimum of one megabyte (1,000,000 bytes) of memory, a minimum of 300 megabytes of disk storage, 2 1600 BPI magnetic tape units, 1-900 to 1100 lines/minute printer, 1-300 cards/minute reader and 1 communications controller.

(Remote Sites) Both cathode ray tube and hard copy terminals (probably a minimum of 24-30) connected directly or by telephone to the central site. 1-300 lines/minute printer.

Software. The operating system must support both multiple concurrent batch (central site processing) and time sharing (remote) operations. Software should include programming languages, utilities (editor, leaders, debuggers, diagnostics), and on-line data entry communication capability.

Performance. Time sharing users must have interactive capabilities with an acceptable terminal response time for a reasonable system load (job mix). Batch operations must be given enough of the system resources (available time) in order to complete in a predictable time period.

Security. Each user must have job security in order to protect both his and the systems files from unauthorized access. Security is obtained by assigning a unique user password to each person authorized to access computer files.

Job accounting. An accounting summary of the computer resources used must be provided for each job and user to provide a fair method of costing the computer service.

User access. Users wishing to have remote access to the computer should be able to do so without an expensive investment in terminal equipment. User interface with the computer should be easy and simple.

File management. System software for file handling should include direct, sequential and indexed data management capabilities.

Growth capability. Equipment and software must have growth capability using the same peripheral devices and operating systems software to sustain a five year operations period.

Vendor support. Equipment must be maintained by local (in town) personnel with a local parts inventory. System software support should be available for conversion, education and operation of the computer system.

Location. Consideration should be given to moving the computer to the second floor of the Administration Building. A study must be made of the factors and costs involved with the installment of the next computer. Justification for this request is as follows:

1. The computer equipment and information stored within are a big investment. A loss of either would be very expensive both in time and money. Location in the Administration Building would reduce the possibility of such loss arising from deliberate or inadvertent damage by persons who enter the Computer Center area. Exclusion of unathorized persons would be easier if the Computer Center is located in a more protected area.

2. Less time and expense by administrative users would result from closer proximity to administrators. Communication equipment and associated costs would be reduced.

Removing the Computer Center from the CIS Department area would not reduce the instructional effectiveness of the computer, since operational access to the computer is not now provided. Instead, card decks are physically delivered to the computer center operator for processing. With the new system, students would enter programs via a terminal located in the CIS laboratory. In fact, student service by the computer would be enhanced by the interactive capability of job entry.

Request for Proposal

The recommended approach to obtaining needed equipment and software is through the Request for Proposal (RFP). The RFP is a document in which the user requests each potential vendor to submit a proposal for a computing system to satisfy specified needs. The vendor's proposal is to be drawn up according to specific guidelines contained in the RFP. Specifications must be formulated such that the vendor has a clear and detailed picture of the user needs and how to respond to these needs. The RFP serves to put the vendors into a directly competitive position to maximize their responsiveness to the user's needs at the least cost.

Every attempt should be made to openly communicate with vendors on how proposals will be evaluated. Such openness will allow the vendor to recognize intended meanings of statements which might otherwise be obscure. The vendor has a right to know not only how the proposal will be evaluated but also what factors are important and the relative importance of each factor. Specifications should be written in a way to emphasize functional user requirements rather than equipment characteristics. Also, stated requirements should be classified as either mandatory or desirable, to designate those which absolutely must be met in order for the proposal to be considered further and those that have a value but which the user may be willing to forego or acquire elsewhere.

Identical RFP documents must be made available to all vendors. While, in principle, any vendor who wishes to bid should be allowed to do so, those vendors who have a very low likelihood of meeting the needs of the college should not be invited to bid and might even be discouraged from doing so. Issuing requests and receiving proposals should normally be handled through the purchasing department. Prior to the issuance of RFPs, a meeting of invited vendors should be scheduled to discuss major points and allow questions. A deadline on receipt of proposals should be announced, along with the statement that all proposals are to be considered as final.

The RFP should include the following elements:

1. Statement of confidentiality.
2. Purpose.
3. Deadline.
4. Required content of vendor's response.

    a. Feature requirements
    b. Hardware and software requirements
    c. Performance
    d. Cost
    e. Validaton possibilities
    f. Conversion assistance
    g. Vendor's support
    h. Backup
    i. Guararantees

5. Statement of needs, to include work load, profile and projections. This should also include special features, conversion needs, and support needs.
6. Proposal validation.
7. Selection of the successful proposal.

The RFP should be designed to secure equipment, software, and other considerations as outlined in the following list.

Hardware

Central Site

Central Processing Unit (CPU)
Console I/O
  CRT
  Hard copy
Printer (2)*
Tapes (2)
Card Reader (2)*
Card Punch
Disks
  Controller
  Channels
  Drives
Communications Controller
Lines
Terminals
  CRT
  Hard copy
Optical Scan

Plotter

*One printer and one reader at central site: one each at CIS Department.

Software

- Operating System
  - Multiprogramming
    - Batch
    - Timeshare
    - Realtime
  - Tuneable
  - Dynamic Disk Space Allocation
  - File Access
    - Sequential Access (SAM)
    - Direct Access (DAM)
    - Indexed Access (ISAM)
  - Spooling of 1/O
  - Ease of Use
- Utilities
- Sort (Stand alone)
- Languages
  - Batch
    - COBOL (ANS)
    - FORTRAN (ANS)
    - Assembler
    - RPG
  - Interactive
    - COBOL
    - FORTRAN
    - BASIC
    - APL
    - PL/1
  - Test & File Editors
  - Debuggers
- Communications (Teleprocessing)
- Data Base Management System (DBMS)
- Statistical Packages
- System Job Accounting
- Security Access
- Job Control

Other Considerations

- Vendor Support
  - Hardware
  - Software
  - Personnel
- Financing
  - Rent
  - Lease
  - Purchase

Obsolescence factor
    Administration
    Educational
Conversion
    Difficulty
    Costs
Alternate equipment
Expanding demands
    Hardware availability & cost
    Software availability & cost